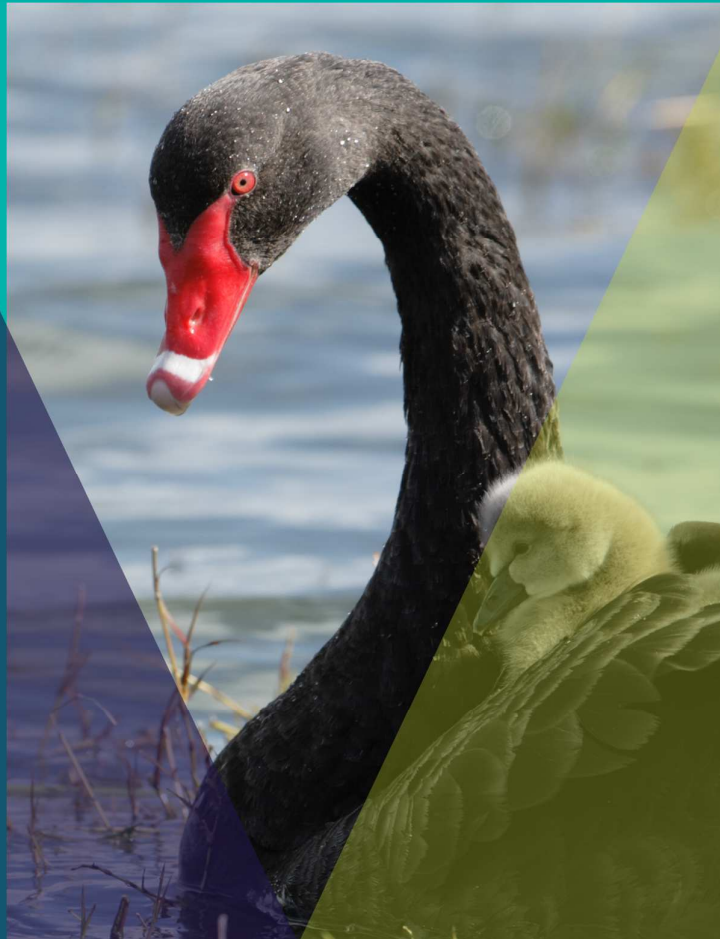


Victorian Summer Waterbird Count 2017

Peter Menkhorst, Geoff Brown and Kasey Stamation



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Cover photo Black Swan carrying cygnets on back. Peter Menkhorst

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Summary

The Victorian Summer Waterbird Count (SWC) is a state-wide survey of selected wetlands conducted in late February each year. It aims to gather numerical, locational and breeding data about game ducks and non-game waterbirds to inform management decisions during the forthcoming duck hunting season.

The number of wetlands counted has varied over the 31 years of SWCs. This variation in survey effort between years has resulted in biases in the database which affect its utility. In years of fewer surveyed wetlands, effort is concentrated on known productive wetlands, popular hunting areas, and wetlands with a history of attracting threatened species, in order to better serve the main hunting management objective of the SWC; that is, to identify areas that could be considered for further regulation, including closure to hunting to protect significant concentrations of threatened species, or colonies of breeding waterbirds. Therefore, total numbers counted for each species cannot be compared meaningfully between years or regions. Only counts for individual wetlands can be compared inter-annually.

The 2017 SWC was conducted during the two weeks from 13 to 24 February and covered 127 wetlands, all of which contained at least some water. The total count of ducks belonging to the eight game species was 284,430, a 207% increase on the 2016 total which followed a series of dry years in Victoria with significant rainfalls in inland Queensland and New South Wales. The most numerous game species counted in 2017 were Grey Teal (43.7% of all game ducks counted) and Australian Shelduck (28.3%). These two species made up 72% of the game ducks counted with the other six game species making up the remaining 28%.

In 2017, the total count of birds belonging to the eight non-game species was 114,463, a 64% increase on the 2016 total. In numerical abundance, the eight non-game species were dominated by three species (making up 84% of the total count of non-game species): Eurasian Coot, Hoary-headed Grebe and Black Swan. These species may occur at very high densities in prime habitat and did so at the Western Treatment Plant during the 2017 count, when they made up 49.3%, 58.6% and 33.2% respectively of their state-wide total. Two species of non-game waterbird showed declines over the previous year – Blue-billed Duck and Musk Duck.

In 2017, information collected during the Summer Waterbird Count contributed to the decision to close four wetlands to duck hunting due to the presence of significant numbers of threatened species. These were: Lake Natimuk (Freckled Duck), Lake Muirhead State Game Reserve (Brolga), Big Reedy Lagoon State Game Reserve (Great Egret) and Tower Hill State Game Reserve where a partial closure took place due to the numbers of Blue-billed Ducks using the deep western wetland. Other closures were made progressively through the duck hunting season but these were not based on data collected during the SWC.

Introduction

Annual counts of waterbirds have been conducted at wetlands across Victoria since 1987, when the then Department of Conservation, Forests and Lands implemented a recommendation from a review of the management of duck hunting within the state (Loyn 1989, 1991). Throughout this period, the purpose of the Summer Waterbird Count (SWC) has been to collect selected information regarding waterbird numbers and distribution. This information helps to inform management of the forthcoming duck hunting season. Dates for the SWC are set so that enough time is available to recommend further regulation of duck hunting and for recommended wetland closures to be legally enacted prior to opening day.

All count data obtained during these surveys are stored in departmental databases held at the Arthur Rylah Institute for Environmental Research (ARI) and are submitted to the Victorian Biodiversity Atlas (VBA). Results of SWCs have been published in various reports (Martindale 1988; Hewish 1988; Peter 1989–1992; Purdey and Loyn 2011, 2013; Purdey and Menkhorst 2014, 2015) or are available as unpublished summaries (Price 1993; O'Brien 1994; Pert 1995; Norman 1996–2006; Norman and Purdey 2007; Purdey and Loyn 2008–2010, Menkhorst and Purdey 2016).

The coverage achieved during SWCs has been reduced from those of previous years because of declining departmental capacity to cover a large sample of wetlands. Therefore, the 2017 SWC continued the strategy (introduced in 2015) of limiting survey coverage to a total of 130 wetlands deemed to be important duck hunting sites on public land, rather than including any wetland, regardless of whether or not it is open to hunting. The one exception to this strategy is the inclusion of the Western Treatment Plant, an extensive series of wetlands not open to hunting, where comprehensive waterbird counts have been conducted six times per year since 2000 (Loyn et al. 2014). Data from the Western Treatment Plant provide detailed baseline data against which the results of the SWC from elsewhere in the State can be compared.

Thus, the objectives of the 2017 Summer Waterbird Count were to:

1. identify wetlands that are open to hunting and are holding large numbers of significant non-game waterbirds (to inform consideration of further regulation including closure of individual wetlands to hunting)
2. identify cases of local breeding by waterbirds, particularly colonial species (for consideration of further regulation including closure to hunting)
3. provide details on the distribution and numbers of game and non-game species of waterfowl on wetlands open to hunting.

This report presents a summary of results obtained in the 2017 SWC, conducted between 13 and 24 February in 2017.

Methods

Survey methods

Although most wetlands were surveyed by staff from either DELWP or the Game Management Authority (GMA), a number were surveyed independently by volunteers from Field and Game Australia or Birdlife Australia. Counts were made of all waterbirds on a wetland (or a defined part of a large wetland) using binoculars or a spotting scope. Observers were asked to record the wetland name, location (using Australian Map Grid (AMG) references or nearby towns as a guide), date, time, species and number of birds of each species present. At each wetland, an estimate of water level was taken as a percentage of its full supply, and the proportion of the wetland area surveyed was estimated, if the entire wetland could not be surveyed. Observations of breeding for any waterbird species were also recorded, with numbers of broods or nests (and contents where appropriate).

Survey organisation

The SWC was coordinated centrally through the Arthur Rylah Institute for Environmental Research (ARI) in collaboration with the GMA. Five DELWP regional coordinators were assigned the task of arranging the on-ground logistics. Because Port Phillip Region had only one priority wetland (the Western Treatment Plant (WTP), no Coordinator was required from that region.

Each regional coordinator was responsible for liaising locally with other DELWP and GMA officers in their region, distributing instructions and count forms, and ensuring adequate coverage of regional wetlands without duplication. The coordinators acted as a conduit for problems encountered during surveys, and were expected to review completed forms before forwarding them to the central coordinator by a specified date.

Regional coordinators were also required to inform the central coordinator immediately if Freckled Ducks, large aggregations of other uncommon or threatened waterbirds, or significant breeding events (e.g. colonial waterbirds), were detected during counts. In cases where a wetland was counted by persons other than Government Agency staff and significant waterbird values were reported, a Government agency staff member was sent to the site to verify the report.

Completed forms, once processed locally, were scanned and emailed to the central coordinator as soon as they were available. This allowed preliminary data to be examined for records of rare or threatened non-game species, or any evidence of breeding birds that might require special protection. At ARI, staff checked all data sheets for accuracy and completeness, queried coordinators or individual observers on unusual or deficient records and entered data into a Microsoft Access® database.

Count dates

The 2017 SWC was conducted over a 12-day period (13-24 February 2017), corresponding closely to the time of year of previous counts and allowing sufficient time for a preliminary review of the data to enable decisions regarding the management of the forthcoming duck hunting season.

Wetlands surveyed

In 2015, the strategy for selecting wetlands to be counted changed from one of encouraging surveys of any wetland to requesting surveys only of important duck-hunting wetlands. One result of this approach is that wetland selection is not biased by factors such as proximity and ease of access, rather, it focusses on wetlands that are likely to be visited by hunters and thereby reduces the risk of missing important waterbird populations that may be at risk from hunting. Before the 2016 SWC, the list of priority wetlands was further refined to remove very large wetlands that cannot be comprehensively counted, such as water supply dams (e.g. Lake Hume and Lake Eildon) and Western Port. The list of priority wetlands for 2017 is provided in Appendix 1.

Species counted

Sixteen species of waterbirds (eight game and eight non-game) are considered for routine analysis in the SWC. These species include all eight species of game ducks (family Anatidae) as well as non-game waterbirds that commonly associate with these ducks. The prescribed game species are Australasian Shoveler *Anas rhynchos*, Australian Shelduck *Tadorna tadornoides*, Australian Wood Duck *Chenonetta jubata*, Chestnut Teal *Anas castanea*, Grey Teal *Anas gracilis*, Hardhead *Aythya australis*, Pacific Black

Duck *Anas superciliosa* and Pink-eared Duck *Malacorhynchus membranaceus*. Note that the Australasian Shoveler was declared a prohibited species for the 2017 duck hunting season.

The eight non-game species included in the SWC are four other species of Anatidae – Freckled Duck *Stictonetta naevosa*, Blue-billed Duck *Oxyura australis*, Musk Duck *Biziura lobata* and Black Swan *Cygnus atratus* – and four other waterbirds that commonly associate with species of Anatidae in Victoria – Australasian Grebe *Tachybaptus novaehollandiae*, Hoary-headed Grebe *Poliiocephalus poliocephalus*, Great Crested Grebe *Podiceps cristatus* and Eurasian Coot *Fulica atra*. Other notable (rare or threatened) species are also counted if present.

Results

Number of wetlands counted

The 2017 SWC contributes to a dataset now spanning the 31 years from 1987. Table 1 provides the total counts of eight game and eight non-game waterbird species from each of the SWCs along with the number of wetlands counted. These data show that the number of surveyed wetlands peaked in the 1989–1993 period and declined thereafter. The 2017 SWC included 127 wetlands across Victoria (Table 1), a slight decrease over the previous year, however, because 67% of wetlands counted in 2016 were dry during that count period, but were still included as counted (Menkhorst and Purdey 2016), the actual count effort was considerably higher in 2017. The numbers of priority wetlands in each DELWP Region and the number that were actually surveyed in 2017 are shown in Table 2.

In 2017, 104 of the 130 recommended wetlands were surveyed (Table 1), the exceptions are indicated in Appendix 1, and a further 23 non-priority wetlands were also surveyed.

Game species

In 2017, the total count of ducks belonging to the eight game species was 284,430 (Tables 1 and 3). This total represents a 207% increase on the 2016 total (Table 3) which followed a period of particularly dry years. All species except Pink-eared Duck were recorded in much higher numbers in 2017 than in 2016, with Australian Wood Duck and Hardhead showing 30- and 8-fold increases respectively and Australian Shelduck, Pacific Black Duck, Grey Teal and Australasian Shoveler showing roughly 3-fold increases over 2016 counts (Table 3).

The most numerous game species counted in 2017 were Grey Teal (43.7% of all game ducks counted) and Australian Shelduck (28.3%). These two species made up 72% of the game ducks counted with the other five game species making up the remaining 28% (Table 3).

Non-game species

In 2017, the total count of ducks belonging to the eight non-game species was 114,463 (Tables 1 and 4), a 54% increase on the 2016 total (Table 4). In numerical abundance, the eight non-game species were dominated by three species: Eurasian Coot, Hoary-headed Grebe and Black Swan, which together comprised 84% of non-game birds counted. These species may occur at very high densities in prime habitat and did so at the Western Treatment Plant during the 2017 count, when they made up 49.3%, 58.6% and 33.2% respectively of their State-wide total (Table 5).

Two species, in particular, showed significant declines over the previous year – Blue-billed Duck and Musk Duck (Table 4).

Table 1. Summary of Summer Waterbird Counts conducted in Victoria from 1987 to 2017.

Year	Count Period	Number of wetlands surveyed	Total count of game species	Total count of non-game species
1987	17–25 January	332	205,000	177,000
1988	6–14 February	472	294,108	185,821
1989	4–12 February	626	292,598	170,375
1990	18–26 February	668	385,148	225,230
1991	16–24 February	786	414,417	264,610
1992	22 February–1 March	659	408,004	219,411
1993	20–28 February	534	218,562	107,650
1994	26 February–6 March	284	292,899	173,887
1995	25 February–5 March	367	196,955	141,609
1996	24 February–3 March	234	200,861	197,916
1997	22 February–2 March	223	124,914	92,003
1998	21 February–1 March	309	216,476	152,348
1999	27 February–7 March	312	206,839	128,969
2000	26 February–5 March	298	128,021	78,675
2001	24 February–4 March	336	240,671	102,926
2002	23 February–3 March	225	231,235	106,191
2003	22 February–2 March	175	155,623	93,972
2004	21–29 February	249	187,139	85,468
2005	19–27 February	272	155,069	81,950
2006	25 February–5 March	268	182,487	85,887
2007	24 February–4 March	176	91,210	46,770
2008	23 February–2 March	191	58,628	41,454
2009	21 February–1 March	161	78,723	38,283
2010	20–28 February	153	77,649	35,485
2011	19 February–6 March	201	104,903	16,768
2012	11 February–4 March	136	212,865	81,848
2013	9 February–2 March	133	185,507	103,467
2014	10-23 February	166	267,055	113,717
2015	16-28 February	126	159,666	74,290
2016	15-26 February	131	92,168	74,452
2017	13-24 February	127	283,430	114,463
Mean		301	204,801	116,545

Table 2. Coverage of priority wetlands in the 2017 Summer Waterfowl Count by DELWP Region.

DELWP Region	Number of priority wetlands	Number surveyed (%)	Number of non-priority wetlands surveyed
Barwon South West	36	31 (86)	7
Grampians	30	27 (90)	4
Gippsland	7	4 (57)	8
Hume	16	15 (94)	1
Loddon Mallee	40	26 (56)	3
Port Phillip	1	1 (100)	0
All	130	104 (80)	23

The contribution of the Western Treatment Plant

The high counts of both game and non-game species in the Port Phillip Region is mainly due to the disproportionate impact of the Western Treatment Plant (WTP) near Werribee (Table 5). This 11,000 ha site is comprehensively and meticulously counted as part of a monitoring program undertaken for Melbourne Water (Loyn et al. 2014). Part of this extensive complex of permanent wetlands is used for the treatment of sewage, and much of the site is managed to maintain its value as wildlife habitat, as recognised under the Ramsar Convention. It is not open to hunting. In years of relatively low rainfall the site has regularly contributed more than half the birds counted during SWCs.

The relatively wet lead up to the 2017 SWC meant that the WTP accounted for a lower proportion of birds counted than in previous years – 30.9% of game ducks counted and 42.2% of the non-game species (Table 5). It held more than 50% of birds counted for five species: Australasian Shoveler, Hardhead (thus providing important refuge for the two least common game ducks), Hoary-headed Grebe, Blue-billed Duck and Musk Duck (Table 5).

Because it is regularly (six times per year) and meticulously counted, the WTP provides an excellent baseline against which trends determined from the Summer Waterbird Counts can be assessed. For this reason, we recommend that the WTP should continue to be counted during the Summer Waterbird Count, noting that this is done at no cost to DELWP or the GMA.

Freckled Duck

The Freckled Duck *Stictonetta naevosa* is a non-game species that is of particular concern because it is listed as a threatened species under the Flora and Fauna Guarantee Act 1988 and meets the criteria for Endangered status (DSE 2013). Freckled Duck are at risk of being shot during duck hunting season because they can be difficult to distinguish from Pacific Black Duck and Hardhead when flying. The Game Management Authority is keen to minimise the risk to this species during the duck hunting season.

In 2017 there were above average numbers of Freckled Duck present in Victoria and these were scattered across 20 of the 127 wetlands counted (Table 6); almost one quarter of these were at the WTP.

Breeding and moulting

The SWC is timed to fall immediately prior to the annual duck hunting season and after the main waterbird breeding period (July-January in Victoria). During the 2017 SWC a large breeding event of Black Swan was detected at Lake Martin, including many pairs sitting on eggs and several hundred flightless juveniles.

No incidence of large-scale moulting was reported during the 2017 SWC. Most species have typically finished moulting by the time of the SWC, and no need has been recognised to close waters to protect moulting birds for many years. Moulting was considered a significant management issue in the 1970s when duck hunting seasons sometimes opened as early as January (Loyn 1989), coinciding with the peak moulting period for species such as Australian Shelduck, which often gather to moult in large concentrations (Frith

1982). However, with the season prescribed to open on the third Saturday in March of each year, it seems that this is no longer a significant management issue.

Wetlands with high numbers of waterbirds

Wetlands which produced the highest numbers of all waterbirds during the 2017 SWC are listed in Table 7. In general, large waterbodies in the west of the State provided the best waterbird habitat, most smaller wetlands being dry. Wetlands that held high numbers of birds had high numbers of both game and non-game species. Leaving aside the Western Treatment Plant, Barwon South West and Loddon Mallee Regions had the most waterbirds.

Further regulation of hunting activity

In 2017, information collected during the Summer Waterbird Count contributed to decisions to further regulate hunting activity, including the closure of four wetlands to duck hunting due to the presence of significant numbers of threatened species. These were: Lake Natimuk (Freckled Duck), Lake Muirhead State Game Reserve (Brolga), Big Reedy Lagoon State Game Reserve (Great Egret) and Tower Hill State Game Reserve where a partial closure took place due to the numbers of Blue-billed Ducks using the deep western wetland. Other closures (and re-openings) were made progressively through the duck hunting season but these were not based on data collected during the SWC and so are not mentioned here.

Discussion

Limitations and constraints

The limitations and constraints of the SWC need to be appreciated when considering the results. While it is the only long-term, land-based survey of the state's waterbirds, with annual counts since 1987, the number of wetlands surveyed has declined from a peak of 786 wetlands in 1991, to around 130 in recent years. The current level of survey effort renders meaningful state-wide, year by year comparisons increasingly difficult. Staff are encouraged to focus available effort on those wetlands which are on public land, are open to hunting and consistently hold large numbers of game species. This biases the data towards waterbird species that prefer large and more permanent wetlands, and against those species that prefer shallower, more highly vegetated wetlands. Furthermore, as wetland coverage decreases the chances of the survey failing to record aggregations of significant species increases, thereby reducing its value as a tool for managing duck hunting.

The period over which the SWC is to be conducted has been reduced to 12 days during the second half of February. This reduction aimed to have the counts conducted as close as possible to opening day, to minimise error due to waterbird movements between the count and opening day. Even so, the period between the count and opening day, which is necessitated by requirements within the Wildlife Act (1975), was 21 days in 2017, an ample period for flocks of waterbirds to move location. This time lag remains a shortcoming in the decision-making process, as currently structured. To minimise errors of this sort, wetlands at which significant values (above threshold numbers of threatened species or breeding activity) were identified during the SWC were revisited by GMA staff prior to management decisions being finalised to ensure that the value was still present at the site.

The future

The SWC was designed to achieve two main objectives (Loyn 1989, 1991):

1. To locate flocks of threatened waterfowl and breeding aggregations of waterbirds that may warrant closure of the wetland for the duck hunting season
2. To obtain data on numbers of waterbirds in Victoria for long-term monitoring.

Management of game species requires long-term tracking of changes in species abundance across the state and the continent. The inherent variability of the Australian climate has profound effects on the availability of habitat for waterbirds, and breeding opportunities are typically provided by flood events in disparate parts of the continent (e.g. Frith 1982; Kingsford and Norman 2002). To understand the effect of these climatic influences, as well as immediate human impacts, such as hunting and the provision of environmental water, long-term data sets are essential. Such data sets are rare in Australia and many have been discontinued. In Victoria, only Western Port has been monitored long-term, since 1973 (Loyn et al. 1994; Hansen et al. 2015) and the Western Treatment Plant has been intensively monitored since 2000 (Loyn et al. 2014). On a much broader scale, the Eastern Australian Waterbird Survey, which began in 1983, has provided annual abundance indices of waterbirds and wetland habitats across a standard series of aerial census lines from Queensland to Victoria and into South Australia (see <https://www.ecosystem.unsw.edu.au/content/rivers-and-wetlands/waterbirds/eastern-australian-waterbird-survey>).

The SWC adds a broad perspective to our understanding of waterfowl numbers and distribution within Victoria, with data having been collected from a large number of wetlands (126+ annually, and approximately 1,500 altogether) between 1987 and 2016. The data summarised here add to the series which is used to assist future decisions about duck hunting and wetland management in the State, as envisaged in Loyn (1991). Only a sample of the State's wetlands is surveyed each year and it should be stressed that most of these counts do not provide data on absolute numbers of waterbirds. While the main aim is to identify wetlands that warrant consideration for further regulation of hunting (objective 1), they also have value as indices of abundance for comparisons between years (objective 2) (for example, Murray et al. 2012).

Until recent years the coverage of Victorian wetlands achieved during the SWC was adequate to meet both objectives. Summer Waterbird Count data have provided helpful contextual information for the interpretation of other waterfowl monitoring programs (see for example, Loyn et al. 2014). However, declining capacity and effort raises doubts about the efficacy of the SWC to meet these objectives, particularly objective 2.

We recommend a reassessment of the aims and methods adopted to assess the impact of the Victorian duck hunting season on populations of game species, and to monitor waterbird populations more generally.

Table 3. Numbers of each game species counted in each DELWP region during the 2017 Victorian Summer Waterbird Count. Percentages are the species proportion of the total count of all eight game species. Note that the Australasian Shoveler was removed from the list of game species for the 2017 duck shooting season.

DELWP region	Species								Total
	Australian Wood Duck	Australian Shelduck	Pacific Black Duck	Chestnut Teal	Grey Teal	Australasian Shoveler	Pink-eared Duck	Hardhead	
Barwon South West	1910	38,029	7417	5210	54527	1138	5029	4029	117,289
Gippsland	1	609	154	2260	991	14	29	9	4,067
Grampians	715	6052	3454	253	29929	2250	2572	1,658	46,883
Hume	105	0	278	0	438	0	10	25	856
Loddon Mallee	1254	1465	1041	40	18,857	352	2,718	1,145	26,872
Port Phillip	9	34,051	2776	7412	19,012	5,078	6,695	12,430	87,463
2017 total (% of total game birds)	3994 (1.4%)	80,206 (28.3%)	15,120 (5.3%)	15,175 (5.3%)	123,754 (43.7%)	8,832 (3.1%)	17,053 (6.0%)	19,296 (6.8%)	283,430 (100%)
2016 total (% difference, 2017-2016)	125 (3095%)	19,586 (309%)	4,145 (272%)	10,086 (50%)	30,982 (299%)	2,068 (327%)	23,117 (-26%)	2,059 (837%)	92,168 (998%)

Table 4. Numbers of the selected species of non-game waterbirds counted in each DELWP region during the 2017 Victorian Summer Waterbird Count. Percentages are the species proportion of the total count of all eight non-game species.

DELWP Region	Species								Total
	Eurasian Coot	Great Crested Grebe	Australasian Grebe	Hoary-headed Grebe	Freckled Duck	Black Swan	Blue-billed Duck	Musk Duck	
Barwon South West	1,663	3	10,305	11,457	54	15,089	549	128	39,248
Gippsland	465	0	0	42	56	182	0	12	757
Grampians	8,810	8	3298	623	69	1170	11	31	14,020
Hume	362	0	10	5	0	6	0	0	383
Loddon Mallee	7,167	17	591	733	162	2803	245	34	11,752
Port Phillip	17,988	5	57	18,186	106	9581	2,068	312	48,303
2017 total	36,455	33	14,261	31,046	447	28,831	2,873	517	114,463
(%)	(31.8%)	(0.03%)	(12.6%)	(27.1%)	(0.4%)	(25.2%)	(2.5%)	(0.4%)	(100%)
2016 total	23007	44	544	29117	174	12357	7848	1361	74452
(% difference, 2017-2016)	(958.4%)	(-25.0%)	(2521%)	(6.6%)	(156.9%)	(133.3%)	(-63.4%)	(-62%)	(53.7%)

Table 5. Proportions (%) of State-wide counts of game and selected non-game species for 2017 that were recorded at the Western Treatment Plant (WTP).

Species	Total count	WTP count	WTP %
Game species			
Australian Wood Duck	3,994	9	0.2%
Australian Shelduck	80,206	34,051	42.4%
Pacific Black Duck	15,120	2,776	18.4%
Chestnut Teal	15,175	7,412	48.8%
Grey Teal	123,754	19,012	15.4%
Australasian Shoveler	8,832	5,078	57.5%
Pink-eared Duck	17,053	6,695	39.3%
Hardhead	19,296	12,430	64.4%
Game species total	283,430	87,463	30.9%
Non-game species			
Eurasian Coot	36,455	17,988	49.3%
Great Crested Grebe	33	5	15.1%
Australasian Grebe	14,261	57	0.4%
Hoary-headed Grebe	31,046	18,186	58.6%
Freckled Duck	447	106	23.7%
Black Swan	28,831	9,581	33.2%
Blue-billed Duck	2,873	2,068	72.0%
Musk Duck	517	312	60.3%
Non-game species total	114,463	48,303	42.2%

Table 6. Numbers of Freckled Duck recorded during Summer Waterbird Counts, Victoria, 1987–2016.

Year	Number of wetlands counted	Number of wetlands with Freckled Duck	Total count of Freckled Duck
1987	445	23	219
1988	484	7	69
1989	642	11	76
1990	665	13	95
1991	786	12	167
1992	664	14	106
1993	504	13	149
1994	343	6	44
1995	367	4	63
1996	234	1	2
1997	223	2	55
1998	309	1	4
1999	298	8	82
2000	328	2	16
2001	336	7	32
2002	225	9	550
2003	175	10	798
2004	249	11	929
2005	272	9	186
2006	268	13	661
2007	176	5	82
2008	191	3	46
2009	161	2	69
2010	153	2	9
2011	201	2	8
2012	136	7	133
2013	133	23	1,056
2014	166	18	2,803
2015	126	9	258
2016	130	4	174
2017	126	20	447
Mean	307	8.7	303

Table 7. Five most populous wetlands (for the eight game and eight non-game species) in each DELWP Region in 2017.

DELWP Region	Wetland	Count
Barwon South West	Lake Martin	35,499
	Lake Tooliorook	33,445
	Lake Rosine	18,600
	Lake Colangulac	13,432
	Lake Milangil	11,720
Gippsland	Victoria Lagoon	2,418
	Jack Smith's Lake	1738
	Morley's Swamp	1079
	Clydebank Morass	628
	Hollands Landing Lagoon	505
Grampians	Booroopki Swamp	13,922
	Lake Natimuk	7,802
	Lake Buninjon	5786
	Waurm Swamp	5540
	Jacka Lake	4180
Hume	Lake Buffalo	756
	Big Reedy Lagoon	395
	Moodie Swamp	220
	Murchison Swamp	180
	Loch Garry	130
Loddon Mallee	Lake Buloke	10,022
	First Marsh	6498
	Lake Cooper	5953
	Lake Elizabeth	5779
	Racecourse Lake	2399
Port Phillip	Werribee Treatment Plant	136,324

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Appendix A List of priority wetlands for Summer Waterbird Count, 2017

* - priority wetlands that were not counted during the 2017 Summer Waterbird Count.

REGION	MAP	AMG	WETLAND NAME
Gippsland			
			McLeod Morass*
			Jack Smith Lake
	8321	174861	Lake Kakydra*
	8321	178778	Dowd Morass
	8321	395891	Victoria Lagoon*
	8522	313175	Lake Corringale*
	8622	379200	Lake Curlip*
Hume			
	7925	486898	Loch Garry
	8125	130040	Dowdle Swamp
	8125	448096	Lake Moodemere*
			Buffalo Dam
			Big Reedy Lagoon
			Black Swamp (Black dog creek)*
			Black Swamp (Nine mile creek)*
			Jubilee Swamp*
			Lehmann Swamp
			McBurney Swamp*
			Moodie Swamp
			Morphett Swamp*
			Murchison Swamp
			Rowan Swamp*
			Tungamah Swamp
			Reedy Lake Nagambie*
Port Phillip			
	7821	880910	Western Treatment Plant
Barwon South West			
	7721	470630	Lake Modewarre*
	7721	491604	Brown Swamp
	7721	739680	Reedy Lake, Connewarre
	7721	770658	Lake Connewarre
	7721	770658	Hospital Swamp

REGION	MAP	AMG	WETLAND NAME
	7721	430617	Lake Gherang
	7322	40185	Lake Kennedy
	7322	71205	Lake Linlithgow
	7422	665228	Lake Turangmoroke*
	7521	13647	Carter Swamp*
	7521	29789	Horsepoles Dam
	7521	38768	Lake Terangpom
	7521	64793	Lake Coradgill*
	7521	74780	Lake Terang Goodwitch
	7521	79769	Lake Punpundal
	7521	79776	Lake Balkil Narra
	7521	121897	Lake Struan
	7521	754526	Lake Elingamite
	7521	858772	Lake Bookar
	7521	898723	Lake Colongulac
	7521	932773	Lake Round
	7521	934727	Lake Kariah
	7521	942799	Lake Milangil*
	7521	958712	Lake Koreetnung
	7522	907998	Deep Lake
	7522	994938	Lake Tooliorook
	7522	767254	Holdsworth Swamp*
	7522	778199	Lake Oundell
	7621	255870	Lake Rosine
	7621	268572	Lake Colac
	7621	280809	Lake Martin/Cundare Pool
	7621	350710	Lough Calvert
	7621	351812	Lake Weering
	7621	355609	Lake Forest
	7621	362762	Eurack Swamp*
	7621	540707	Lake Murdeduke
Grampians			
	7225	820090	Lake Hindmarsh*
	7226	880425	Lake Albacutya*
	7423	424499	Lake Muirhead
	7423	442884	Lake Fyans
	7423	444012	Lake Lonsdale
	7324	157293	Dock Lake*
	7324	203286	Pine Lake

REGION	MAP	AMG	WETLAND NAME
	7324	232280	Lake Taylor
	7423	565487	Shooters Swamp
	7423	577507	Lake Buninjon
	7522	80430	Lake Goldsmith
	7522	901350	Lake Wongan
	7622	300458	Black Swamp
	7622	339460	Lake Burrumbeet
	7623	433583	Coghills Creek Dam
	7623	483763	Merin Merin Swamp
	7124	190379	Waurin Swamp
	7124	198346	Boorooopki Swamp
	7124	212363	Yarrackigarra Swamp
	7124	239180	Winter Lake
	7124	285213	Lake Carpolac
	7124	423304	Wally Allens Swamp
	7224	453252	Lake Koynock
	7224	456236	Lake Karnak
	7224	703388	Connan Swamp
	7224	722263	Jacka Lake
	7224	763195	Lake Clarke
	7224	838374	Lake Natimuk
	7223	671945	McGlashins Swamp
	7223	841032	Toolondo Reservoir
Loddon Mallee			
	7124	424190	Woolshed Swamp*
	7299	920084	Meridian Basin*
	7326	259448	Lake Coorong*
	7329	973215	Horseshoe Bend Billabong*
	7424	723544	Lake Hancock*
	7424	735570	Lake Batyo Catyo
	7425	744792	Little Lake Buloke*
	7425	756856	Lake Buloke
	7428	715580	Lake Powell
	7525	821629	Browns Lake
	7525	845622	Lake Nurrumbeet*
	7525	847632	Lake Grassy
	7525	975835	Wooroonook Lake (Main)*
	7525	988840	Wooroonook Lake (Church)*
	7626	470566	Third Marsh (Top Marsh)*

REGION	MAP	AMG	WETLAND NAME
	7626	480513	First Marsh (The Marsh)
	7626	482472	Lake Bael Bael
	7626	483545	Second Marsh (Middle Marsh)
	7626	495662	Lake Tutchewop*
	7626	510523	Lake Cullen
	7626	533280	Tobacco Lake*
	7626	551457	Lake Elizabeth
	7626	587335	Lake Murphy*
	7626	602408	Brandy Lake (L. Wandella)*
	7726	344450	McDonald Swamp*
	7726	380275	Hird Swamp*
			Johnson Swamp*
			Lake Meran
			Lake Yando
			Lake Boort
			Richardson Lagoon
			Lake Leaghur
			Gil Gil
			Heywood Lake
			Lake Cooper
			Gaynor Swamp
			Wallenjoie
			Mansfield Swamp
	7825	40632	Racecourse Lake
	7825	60654	Green Lake

